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A Talbot cypress swamp at Greenbury Point, Maryland

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Greenbury Point is situated easterly across the Severn River from Annapolis in Anne Arundel County, Maryland and is mapped by the Maryland Geological Survey as Talbot formation. As a matter of fact although most of the Point was bevelled by the Talbot sea to form the Talbot terrace of late Pleistocene age much of the area is made up of sediments belonging to the Aquia formation (Eocene). In the summer of 1932 the writer discovered, as a result of wave cutting, another of those interesting buried bald cypress forests which are so frequently found in the Pleistocene of the Coastal Plain north of the present northern limits of the bald cypress.[1]

This buried cypress swamp was revisited on September 28, 1933 by Dr. R. E. L. Collins and the author at which time a great number of fossil seeds, which had weathered out of the dark carbonaceous mud, were collected. It is the description of these seeds and the remains of the Pleistocene cypress swamp which forms the basis of the present paper.

The hurricane—which did so much damage along the Atlantic Sea Coast during the month of September—washed away about seven feet of the end of the Point. This erosion did not expose any new cypress stumps. The Point at the time of our visit had a vertical face of approximately 15 feet with no slumping at its base—due to the recent storm. There are several contrasting lithologic beds in this 15 foot vertical range and most of these beds pinch out in an east and west direction. From all aspects this swamp occupied a deep valley cut in the Eocene sediments which was subsequently covered by reworked Eocene material.

[1] Similar deposits are also found at many localities within the modern range of the species.

At the base of the cliff there is a five foot bed of very black carbonaceous clay. It is in the lower portion of this bed just at tidal level that the cypress stumps are located. This part of the bed is tightly interwoven with the roots and knees of the cypress stumps, so much so that in places they form a solid wooden floor. This bed extends in an east-west direction for about a hundred feet and then disappears under the sand of the beach. The upper surface of the bed is very irregular for there are in two places evidence of old stream channels. These channels were cut from 1–3 feet deep below the surface and they have

Fig. 1 Showing section and cypress stumps at Greenbury Point, Maryland

a width of several feet. They are now filled with very coarse iron stained quartz sand. On the weathered surface of this bed and for a depth of about 2 inches below the surface one finds botryoidal aggregates—up to $\frac{3}{4}$ inches in diameter—of vivianite. Vivianite is a hydrous ferrous phosphate which is often found in cavities of fossil bones and in such swamp deposits as described herein. This mineral after it is partly oxidized is a very intense blue turning duller as oxidation progresses.

During my first visit to this locality I found in this lower bed three poorly preserved casts of Unios. These fossils are in

such a bad state of preservation that it is impossible to determine them beyond the fact that they are Unios. While visiting this locality in 1933 I found on the weathered surface of this carbonaceous bed, near its eastern end, a number of fossil seeds and fragments of plants.

Overlying the carbonaceous bed there is a three foot layer composed of clay and sand greatly iron stained. There are irregular layers of ironstone running unsymmetrically throughout the bed. The clay is grayish brown in color and contains a few grains of white quartz distributed throughout. This bed, which is barren of fossils, pinches out towards the east and west.

Between this bed and the next outstanding one is a thin layer of about 6 inches of white sand composed almost entirely of clear well rounded quartz grains associated with a few milky quartz pebbles of about $\frac{1}{4}$ inch in diameter. This layer of sand is continuous across the entire face of the Point, but fades out after a short distance.

The next bed is a very outstanding one. It is about $1\frac{1}{2}$ feet thick and has a very green color. This color is due to the glauconite which makes up the greater part of the material of this zone. This zone maintains a uniform thickness throughout its length, but it can only be traced a short distance in an east-west direction for it intermingles and dies out into a bed of sandy clay. Just why is a bed composed of glauconite found covering a Pleistocene cypress swamp? That is the first question which presented itself to me, but after following the bed around the Point in both directions and finding that it died out I came to the conclusion that it must contain reworked glauconite from Aquia formation. Along with this glauconite I found fine flakes of white mica. This evidence is also substantiated, as I will show later, by the fact that the age of some of the fossils which I collected are much later than Eocene.

Overlying this glauconite bed there is a layer of $3\frac{1}{2}$ feet of Pleistocene sand and gravel, the upper part of which is mostly top soil. This uppermost layer is continuous over the entire end of the Point.

Clustered around the extreme end of the Point and exposed —only at low tide—are about 25 cypress stumps. The size of these stumps range from 2 to 6 feet or more in diameter. In

several cases there are distinct traces of the "knees" clustered about the base of the stumps. It is a great wonder that the wood of these stumps is in as good condition as it is considering the ice and storms which they withstand during the winter months. Figure 1 shows the face of the Point and several of the cypress stumps partly submerged in the water.

At the time of my first visit to this locality I collected a large quantity of the black carbonaceous muck with the hope that I might be able to find some seeds in it. However, after spending considerable time working over this material while it was soaking in water, I was forced to conclude that seeds must be very rare in the deposit. It was therefore with great enthusiasm that I collected the following fossil material which had weathered out on the surface of the bed. These fossils are: —Rhizomes, *Vitis cordifolia*, leaves of *Taxodium* sp., acorns and cups of *Quercus* sp., and *Retinodiplosis taxodii*.

Rhizomes

Several rhizomes belonging to some species of monocotyledon, probably a marsh plant were found—one of which I have illustrated (Fig. 2, No. 4). This one is more or less spherical except for shriveling. At one end there is a circular depression while at the opposite end there is a bunch of stubby rootlets. Circumscribing this rhizome are several very thin ridges—two of which can be seen in the figure—which are about equally distant from each other. Upon these ridges there are tiny nodes unequally spaced which form the base of the short rootlets. Nearer one end these rootlets are more numerous and more closely spaced.

Very similar rhizomes are found on various kinds of swamp grasses today.

Vitis cordifolia Michaux

There was only one specimen of this grape seed collected, but it is in a very good state of preservation. This grape is commonly called chicken or frost grape among many other names and it inhabits low lying areas near streams and in swamp thickets. Britton and Brown gives the range as from New England westward to Nebraska and south to Florida and

Texas. I feel sure the fact that only one seed was found was due to our overlooking them because of their minuteness.

Grape seeds are very common in deposits of this character, often however, being too badly preserved to give them a specific name. This species of grape has been reported from the Wicomico and Pamlico—both Pleistocene—in Washington. The genus Vitis ranges from the upper Cretaceous to the present.

Fig. 2

1. Retinodiplosis taxodii Felt×2
2. Cup of Quercus sp.×2
3. Vitis cordifolia Michaux×2
4. Rhizome×2
5. Acorn of Quercus sp.×2

Taxodium sp.

The genus *Taxodium* is represented by several poorly preserved leaves. It is most likely that these leaves belong to *Taxodium distichum*, the common bald cypress, which is found today in the nearby regions farther south. These leaves were too poorly preserved to give a definite specific name to them. Even too poorly to be illustrated.

Along with these *Taxodium* leaves and the cypress stumps were found three galls belonging to the species *Retinodiplosis taxodii*.

The range of the bald cypress in the Coastal Plain region is from Southern Delaware and Maryland southward to Florida and westward along the Gulf Coastal Plain to Texas. Many Pleistocene cypress swamps have been discovered within the present range of this species while numerous finds have been reported beyond its range showing that the bald cypress is slowly retreating southward.

The geological range of this species is from Pliocene to recent.

Quercus sp.

Among all the seeds collected, acorns were the most numerous. A definite identification of this species was impossible due to the fact that many of the acorns were immature and the rest too poorly preserved for identification, however, if leaves had been present one might have been able to determine their species.

The mature acorn (No. 5) is oval in shape, somewhat pointed at apex, and the surface slightly striated. The character of the surface changes between the region marked off by a circular line around the fruit and the base of the acorn, where the crack is observed on the left side. This marks the extent to which the acorn was enclosed within the cup. This acorn is split—in the plain of the illustration—thus showing the badly preserved cotyledons.

In the immature specimen (No. 2) only the very tip, which is pointed, of the acorn can be observed. The stalk forms not quite half of the entire height of the cup. The scales on the cup are very thick and closely imbricated making a very stubbled surface. Many of the immature acorns were collected, but without their cups in most cases.

The common oak which is found in the vicinity of Greenbury Point is *Quercus ilicifolia* Wang which is found growing throughout the Coastal Plain region. This Pleistocene oak is probably not closely related to the present inhabitant. The geological range of the oak is from the Upper Cretaceous to recent.

Retinodiplosis taxodii Felt

Some of the most common objects to be found along with the bald cypress scales are numerous small galls (*Retinodiplosis*

taxodii). These galls are the result of some insect which has modified the young cypress seed so that in the mature state they bear no resemblance to naturally developed cypress seeds. These galls are very often found closely packed in the cypress cones.

Three of such galls were collected, two being globose while one was somewhat shriveled. In all three cases there is a minute oval opening at one end.

The fact that the glauconite bed is a reworked one excludes any idea that the cypress swamp might be of Eocene age. This is corroborated by the fact that *Taxodium distichum* has a geological range from the Pliocene to recent. Along with this bald cypress I found several insects galls, *Retinodiplosis taxodii;* a grape seed, *Vitis cordifolia;* and numerous acorns and cups of some undeterminable species of *Quercus;* and also several rhizomes of some unknown marsh plant.

There have been many other discoveries of buried cypress swamps very similar to this one, too many to list here, all of which have been proven to be of Pleistocene age. Therefore it is correct to assume that this deposit at Greenbury Point is of Pleistocene age.

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